REMARKS

Reconsideration and allowance are respectfully requested.

Claims 1-10 are pending. They were rejected under Section 101 because they are allegedly directed to "non-statutory subject matter." Applicants traverse.

In contrast to the Examiner's assertion on page 3 of the Action that "an expression of 'mean' and 'variance' heat flow does not make a concrete result," it was Applicants' intention to indicate that the stochastic equation was solved to obtain an analytical closed form expression for mean heat flow and its error bounds from values (a random thermal conductivity, an exponentially decreasing heat flow function and its associated boundary conditions), which are concrete results, and they are used for the practical applications recited in the independent claim 1 (i.e., "natural gas analyses and/or tectonic studies or studies related to crystallization of minerals").

It would be incorrect to conclude on the basis of the allegations pages 3-4 of the Action that Applicants' "quantification of the earth's surface area heat flow" and "evaluation of the thermal state for related oil and natural gas" are simply "thermodynamic laws of nature" instead of practical applications of their discovery. Moreover, the view that their obtaining an expression for use in a process of evaluating the thermal state of the earth is not a concrete, tangible and useful result would also be incorrect. The basis for the claimed invention resides in evaluation and quantification of a natural phenomenon, but these results are then used to provide guidance or an indication as to the presence of oil fields, seismic activity, mineral deposits, etc. (i.e., geologic conditions) from this thermal state.

It was alleged that no idea was developed to make the application useful on page 4 of the Action. But Applicants' discovery or "idea" is solving the temperature field using a stochastic heat conduction equation implemented on a computer and the inputs of random thermal conductivity, an exponentially decreasing heat source and associated boundary conditions. The thermal state of the earth is governed by natural laws such as those embodied in the laws of thermodynamics. But the evaluation and quantification thereof are not laws of nature; they are useful, tangible and concrete results used for

practical applications such as natural gas analyses and/or tectonic studies or studies related to crystallization of minerals.

Example 2 on the specification is an actual experiment carried out in real time within an Indian seismic zone. The Examiner and one involved in the related art (i.e., a geologist) would appreciate that oil fields and mineral deposits are no longer discovered by simply digging a hole in the ground without measuring and considering geologically-relevant parameters. Here, values such as a random thermal conductivity, an exponentially decreasing heat flow function and its associated boundary conditions are input to a stochastic heat conduction equation and provide a solution to the temperature field using a computer, outputting an expression for mean heat flow and variance in the heat flow. Oil field and mineral deposit related exploration is a huge industry in itself with large amounts of money spent on research. Any method that assists in guiding exploration or providing an indication of the location oil or mineral deposits cannot be held to not possess credible, specific and substantial utility.

What is being claimed in this application is not a mathematical method lacking in reduction to practice. In the claimed invention, the reduction to practice took the form of determining the level and potential for seismic activity in a area which has experienced a major earthquake. The Examiner and geologists would appreciate that any method that allows a prediction with a greater degree of accuracy/certainty of an occurrence of an earthquake also has practical utility. Potential savings of life and property constitute a great value to society. To give a real world example, California has at least one major fault running through it: the Newport – Inglewood fault. Despite its presence, there has been no major earthquake in California for several years. Any method that would allow research and government personnel to become aware of an increased risk of earthquake (and thereby provide a warning to residents of the region) cannot be said to lack practical utility. A list of US patents granted for seismic activity detection methods is attached for the Examiner's consideration, who should note that several of them use software or other computational methods.

There is no requirement to provide working examples for detection of oil field or mineral deposits in patent law or regulations. The investment of time and money to vali-

date the methods of Applicants' invention is large and, as in fields such as information technology and the life sciences, justified after investors are assured that adequate intellectual property protection of the invention has been sought. The essence of the invention resides in obtaining an analytical closed form expression for mean heat flow and its variance, thereby allowing evaluation and quantification of an exponentially decreasing heat flow function and its associated boundary conditions in accordance with claim 1. Example 2 of the specification relates to actual measurements in India's Latur region. A simple Google search will provide any amount of information on the damage of both life and property caused in 1993 by an intraplate earthquake. Prior studies in this area did not include any calculation of variance in heat flow. Applicants' invention enabled them to calculate this essential parameter at the surface or at any given depth, and therefore a better understanding of heat flow and its variance.

Applicants' Example 2 clearly demonstrates a "practical utility" for their invention and a "useful, tangible and concrete" result with "real world" value.

Withdrawal of the Section 101 rejection is requested because Applicants have taught that the claimed invention is useful.

Having fully responded to the pending rejection in this Office Action, Applicants submit that the claims are in condition for allowance and earnestly solicit an early Notice to that effect. The Examiner is invited to contact the undersigned if any further information is required.

Respectfully submitted,

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